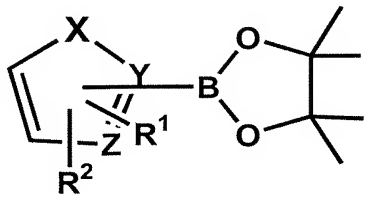
Claim Amendments

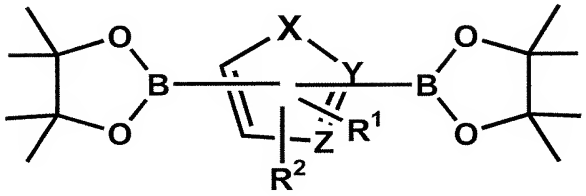
This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1. (Currently Amended) A ~~production~~ process of producing a heteroaryl boron compound represented ~~with general~~ by formula (V) or (VI):



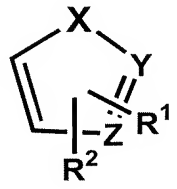
(V)



(VI)

[[(]]wherein, X, Y, Z, R^1 and R^2 are the same as defined below[[)]], comprising:

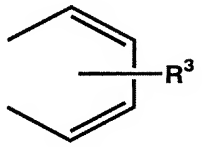
reacting an aromatic heterocyclic compound represented with the following ~~general~~ formula (I):



(I)

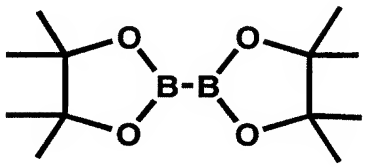
[[(]]wherein[[,]] X represents an oxygen atom, sulfur atom or an imino group which may have a substituent, Y and Z may be the same or different and respectively represent -CH= or -N=, R^1 and R^2 may be the same or different and respectively represent a hydrogen atom, linear or branched C_{1-8} alkyl group, linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group,

C_{1-8} alkoxycarbonyl group, amino group which may have a substituent, or the following ~~general~~ formula (II) in which R^1 and R^2 are adjacent and form a ring:

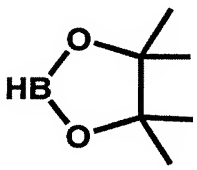


(I I)

[[(]]wherein, R^3 represents a hydrogen atom, a linear or branched C_{1-8} alkyl group, a linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group or amino group that may have a substituent[[))]] with a boron compound represented with the following formula (III) or (IV):



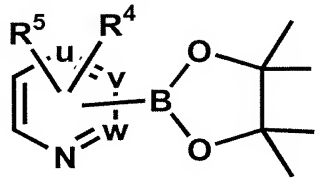
(I I I)



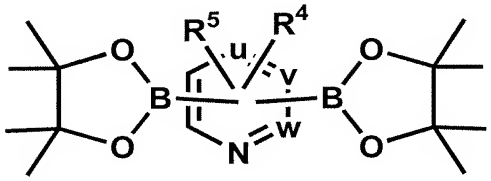
(I V)

in the presence of ~~an~~ a univalent iridium complex ~~containing~~ catalyst ~~and a~~ in which the complexing ligand is a Lewis base having the ability to coordinate with univalent iridium.

Claim 2. (Withdrawn) A production process of a heteroaryl boron compound represented with general formula (VIII) or (IX):

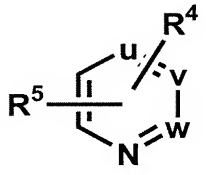


(VIII)



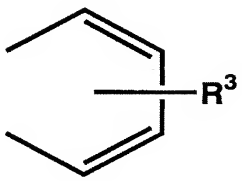
(IX)

(wherein, u, v, w, R^4 and R^5 are the same as defined below) comprising: reacting an aromatic heterocyclic compound represented with the following general formula (VII):



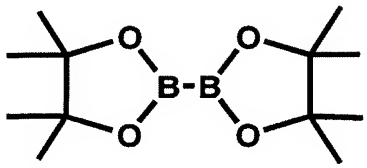
(VII)

(wherein, u, v and w may be the same or different and respectively represent -CH= or -N=, and R^4 and R^5 may be the same or different and respectively represent a hydrogen atom, linear or branched C_{1-8} alkyl group, linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group, amino group which may have a substituent, or the following general formula (II) in which R^4 and R^5 are adjacent and form a ring:

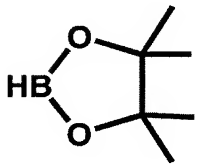


(II)

(wherein, R^3 represents a hydrogen atom, a linear or branched C_{1-8} alkyl group, linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group or amino group that may have a substituent)) with a boron compound represented with the following general formula (III) or (IV):



(III)



(IV)

in the presence of an iridium-containing catalyst and a ligand.

Claim 3. (Currently Amended) ~~A production~~ The process according to claim 1 ~~or claim 2~~, wherein[[,]] the iridium-containing catalyst is ~~that represented with~~ has the following ~~general~~ formula (X):

IrABn (X)

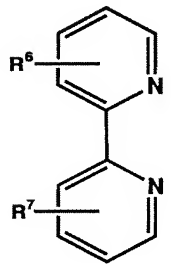
[[(]]wherein[[,]] A represents a chlorine atom, linear or branched C_{1-8} alkoxy group, hydroxyl group or phenyloxy group which may or may not have a substituent, B represents 1,5-cyclooctadiene or 1-cyclooctene, and n represents 1 or 2.

Claim 4. (Currently Amended) ~~A production~~ The process according to claim 3, wherein[[,]] A of the iridium-containing catalyst is a methoxy group, B is 1,5-cyclooctadiene and n is 1.

Claim 5. (Currently Amended) ~~A production~~ The process according to claim 3, wherein[[,]] A of the iridium-containing catalyst is a chlorine atom, B is 1,5-cyclooctadiene and n is 1.

Claim 6. (Currently Amended) ~~A production~~ The process according to claim 3, wherein[[,]] A of the iridium-containing catalyst is a chlorine atom, B is 1-cyclooctene and n is 2.

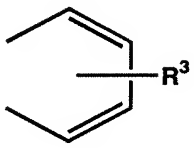
Claim 7. (Currently Amended) ~~A production~~ The process according to ~~any of claims~~ claim 1 ~~through 6~~, wherein[[,]] the ligand is represented by the following ~~general~~ formula (XI):



(X I)

[[(]]wherein[[,]] R^6 and R^7 may be the same or different and respectively represent a hydrogen atom, linear or branched C_{1-8} alkyl group, linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group or amino group which may or may not have a

substituent, or the following ~~general~~ formula (II) in which R^6 and R^7 are substituted at position 6 and position 6':



(I I)

[[(]]wherein[[,]] R^3 represents a hydrogen atom, linear or branched C_{1-8} alkyl group, linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group, or amino group which may or may not have a substituent[[))]].

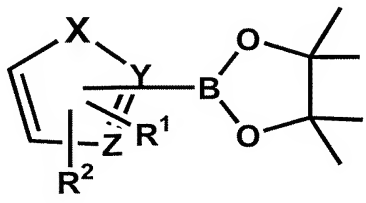
Claim 8. (Currently Amended) ~~A production~~ The process according to claim 7, wherein[[,]] the ligand is 2,2'-bipyridine.

Claim 9. (Currently Amended) ~~A production~~ The process according to claim 7, wherein[[,]] the ligand is 4,4'-di-tert-butyl-2,2'-bipyridine.

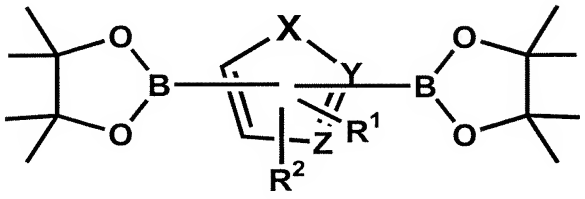
Claim 10. (Currently Amended) ~~A production~~ The process according to ~~any of claims~~ claim 1 ~~through 9~~, wherein[[,]] the reaction is carried out in the presence of solvent.

Claim 11. (Currently Amended) ~~A production~~ The process according to claim 10, wherein[[,]] the solvent is a hydrocarbon.

Claim 12. (New) A process of producing a heteroaryl boron compound represented by formula (V) or (VI):

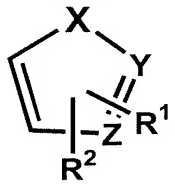


(V)



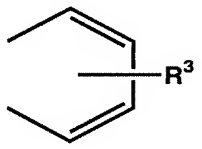
(VI)

wherein, X, Y, Z, R^1 and R^2 are the same as defined below, comprising: reacting an aromatic heterocyclic compound represented with the following formula (I):



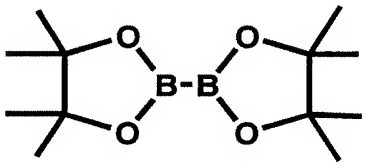
(I)

wherein X represents an oxygen atom, sulfur atom or an imino group which may have a substituent, Y and Z are each -CH=, R^1 and R^2 may be the same or different and respectively represent a hydrogen atom, linear or branched C_{1-8} alkyl group, linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group, amino group which may have a substituent, or the following formula (II) in which R^1 and R^2 are adjacent and form a ring:

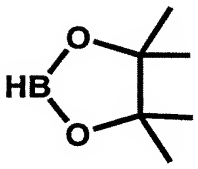


(II)

wherein, R^3 represents a hydrogen atom, a linear or branched C_{1-8} alkyl group, a linear or branched C_{1-8} alkoxy group, nitro group, cyano group, halogenated C_{1-8} alkyl group, halogen atom, carbamoyl group, C_{1-8} acyl group, C_{1-8} alkoxycarbonyl group or amino group that may have a substituent with a boron compound represented with the following formula (III) or (IV):



(III)



(IV)

in the presence of a univalent iridium complex catalyst in which the complexing ligand is a Lewis base having the ability to coordinate with univalent iridium.